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DIVISION OF WATER QUALITY

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September 9, 1996

Mr. Robert A. Prescott
Summo USA Corporation
P.O. Box 847
Moab, Utah 84532

Dear Mr. Prescott:

SUBJECT: LISBON VALLEY COPPER HEAP LEACHING PROJECT
DESIGN REPORT & GROUND WATER PERMIT APPLICATION

We have reviewed plans and supporting information for the construction of a heap leach pad for copper extraction at Lisbon Valley. These documents, prepared by the J. D. Welsh & Associates, Inc., Shepherd Miller, Inc., and Hydro Traid, Limited, were received on July 29, 1996. We have also reviewed *Lisbon Valley Project Utah Groundwater Discharge Permit* Application prepared by Adrian Brown Consultants, Inc. This document was also received on July 29, 1996. Also reviewed as supporting information to the ground water permit application were *Lisbon Valley Project Hydro geologic Evaluation*, March 15, 1996, prepared by Adrian Brown Consultants, Inc. and *Draft-Environmental Impact Statement* [EIS], May, 1996, prepared by US Bureau of Land Management [the BLM] and Woodward Clyde, Inc.

We are in the process of drafting a combined construction and ground water discharge permit. Our following comments are designed to aid in preparing additional information for final review.

1. HEAP LEACH PAD

a. The pad liner system will consist of, an 80-mil high density polyethylene (HDPE) primary liner, 6 inches of compacted soil with the maximum hydraulic conductivity of 1×10^{-7} centimeters per second, gravel leak detection strips containing 2-inch diameter Schedule 80, polyvinyl chloride (PVC) pipe placed at 200 feet on center, and 12 inches of compacted sub-base having the maximum hydraulic conductivity of 1×10^{-6} centimeters per second.

b. The perimeter of the pad will be double lined with 80-mil HDPE and 40-mil polyvinyl chloride (PVC). The 40-mil PVC liner will extend under the ore body to a point, where the ore is heaped to a height of not less than 10 feet. The plans do not show how leakage between the liners will be isolated for repair. We would like to discuss with you methods to isolate smaller areas around the perimeter of the pad for leak detection.

c. Detail D-3 on Sheet 3 shows 18-inch transport pipes protruding through the primary HDPE liner. We recommend that pipes should not protrude though the synthetic liners in those places. There is a possibility of leakage around such protrusions. Transport pipes should be draped over the top of the berm. If piping must be installed within the berm, primary liner should be laid through the base of the berm, and additional HDPE liner draped over the berm.

d. Detail 1-3 on Sheet 3 is mislabeled.

e. The maximum overall slope for the pad should not exceed 2.5 horizontal to 1 vertical from the toe of the heap to the shoulder. This requirement is based not only on pad stability under seismic forces, but on saturated conditions that may occur as a result of uneven irrigation, channeling of water during irrigation, rupture of the distribution lines and high rainfall.

f. A procedure for placing or heaping ore on the leach pad, should be developed to prevent any physical damage to the HDPE liners. Similar protective procedures should be considered or developed for preventing damage to liners in solution channels and launders. We recommend that rounded rock material be placed on the HDPE liner for the protective layer. Angularity of crushed gravel material being placed on top of the HDPE liner should be considered carefully with the liner manufacturer.

g. Compacted clay material above the leak detection layer must not penetrate or migrate more than one-half of one inch into the leak detection media. Please detail steps to be taken for reducing such migration. The gravel leak detection strip could be lined with a goetextile fabric to prevent clay from migrating into the gravel material.

h. The permeability rate of the leak detection layer should not be less than 1×10^{-2} centimeters per second.

2. PROCESS PONDS

a. The slope on the bottom of the process ponds should be a minimum of 2 per cent, preferably 5 per cent. The minimum grade will reduce the time for detecting a leak and reduce a buildup of head on the secondary liner. More than one sump may be needed to accommodate the minimum grade requirement. The plans do not show the slope on the bottom of the ponds.

b. Protective procedures must be developed for preventing damage to the HDPE liner from submersible pumps, moving equipment in and out of the ponds, ice buildups, etc.

c. The pond liner system will consist of, an 80-mil HDPE primary liner, a drainage net, a 40-mil HDPE secondary liner, and a 12-inch thick compacted sub-base with the maximum hydraulic conductivity of 1×10^{-7} centimeters per second.

d. The sump area should be double lined with a synthetic liner. Please submit a detail for our review.

e. Heap leach pads, process solution ponds and the process area must be enclosed with an eight (8)-foot fence. The fence should be designed to restrict access, and meet the requirements of Utah Division of Wildlife Resources.

3. GROUND WATER PERMITTING

a. Ground Water Monitoring

i. As an addendum to your permit application please submit a Sampling and Analysis Plan that describes in detail the procedures for the sampling and handling and lists the lab method and detection limits to be utilized on a parameter by parameter basis. This plan must also describe Quality Assurance and Quality Control [QA|QC] protocols for determining the validation of data analyses and sampling procedures. This plan will become an enforceable appendix to the ground water permit.

ii. In addition to the parameters previously monitored for future ground water monitoring must include analysis for thorium, uranium, radium-226, radium-228. The executive secretary will establish protection levels for thorium and uranium based on proposed maximum concentration levels [MCLs] in drinking water.

iii. The hydrogeologic characterization lacks an adequate characterization of the Navajo aquifer at the site. A monitoring well should be installed for aiding in classification of the Navajo aquifer, determining background water quality. This well is essential as no historic or third party information is available. Upon completion of this well, please submit an as-built report detailing well completion and construction, along with well logs and any additional data generated from aquifer testing or water quality analyses. This well will be placed on an accelerated monitoring schedule following the issuance of the permit. It is our understanding that Summo intends to install this well prior to the issuance of the final EIS by the BLM.

iv. The additional well proposed in the ground water permit application will be required to be installed within 30 days of the issuance of this permit. Accelerated monitoring to establish background will also be required for this well. Based upon pumping tests and the expected startup date for leaching, an accelerated monitoring schedule will be determined. As-builts, geologic logs and pumping test results must also be submitted following the completion of this well. It might be advisable to install this well at the same time as the Navajo aquifer well in order that background information can be collected prior to operation of the heap leach.

b. Closure Plan

i. The closure plan as submitted in the ground water permit application describes the grading and placement of top soil upon the neutralized ore. A vegetative cover

would then be established. Additional cover materials, if any, are not described within the ground water permit application. Depth of top soil should be specified. A discussion of effectiveness of the proposed cover to minimize infiltration, must be a part of the report. A final cover design outlined in conceptual drawings, must be proposed. Discussion concerning the closure plan in the draft-EIS is incomplete due to missing paragraphs (refer to pages 2-39 and 2-40). The revised application should include a complete closure plan for the heap leach project.

ii. A report that details the results of the column neutralization tests being performed on columns of leached ore should be submitted as soon as it becomes available. A neutralization strategy is an essential component of a closure plan. The proposed sequence of neutralization activities will be incorporated into the ground water permit. If the plan cannot be finalized prior to issuance of the permit then it will become a compliance schedule item within the permit.

iii. It is assumed that the heap leach will continue to generate leachate even following the placement of a successful vegetative cover. The closure plan must estimate the quantity of the leachate that will be generated and a plan must be developed for the final disposal of any leachate during the post closure period.

c. Scope of the Ground Water Discharge Permit

i. Based on our review of the draft-EIS and the hydro geologic report, we will reserve the possible permitting of the pits for future permit terms. The draft-EIS concludes that the formation of the pit lakes could result in degradation to near by ground water. Because the theoretical model this conclusion is based upon may or may not represent actual final field conditions it is not possible to factually conclude there will or will not be a long term ground water quality impact. Ongoing study of the hydro geology during mine operation will allow for further refinement of anticipated post-mining conditions. It is anticipated that at minimum Summo will keep records of their dewatering activities and water consumption and will further define what geologic units contain water. Geologic logs for yet to be drilled water supply wells and dewatering activities should also be kept and used to better define the post mining conditions. We anticipate that the permit will require that this information be submitted on an annual basis.

d. Wasterock Management Strategy

i. As stated in our draft-EIS comments of July 15, 1996, we believe that the Waste Rock Selective Handling Alternative, as outlined in the draft-EIS, would significantly reduce the potential for acid mine drainage from the proposed waste rock dumps. Because no specific control technologies such as liners or leakage collection systems have been proposed for the waste dumps, it is prudent to assure that the potentially acid generating materials are selectively placed in the waste dumps such that the potential for acid generation is reduced. To assure that the above is accomplished a waste rock management plan must be submitted as an addendum to your permit

application. The plan once approved will become an enforceable appendix to the permit.

e. Other general items

i. A ground water permit application must be signed by a corporate officer whose name, address and phone number must be included. If the operator is other than a corporate officer, then that person's name, address and phone number must also be given. This signature may appear on a letter of transmittal or on the cover page of the permit application itself. Please refer to the requirements outlined in R317-6-6.3 *Ground Water Quality Protection Rule, Utah Administrative Code.*

ii. Latitude and longitude of the proposed monitoring wells must be provided.

4. OPERATIONS ISSUES

a. An operation and maintenance (O&M) manual for the permitted heap leach facilities must be submitted for review and approval before you begin the operation. The manual should address operational procedures, maximum leaching solution application rates, handling of solutions, inventory of solutions in the process ponds, procedures for a short term and a long term shut down, monitoring requirements, maintenance requirements, steps and procedures to prevent or minimize an overflow of solutions resulting from a series of storm events exceeding the design conditions and other approved operating basis etc. This information will enable operators to understand in detail the requirements of their jobs and to operate facilities according to intended design.

i. A monitoring document will define the frequency of monitoring, notification requirements of different quantities of fluids found in leak detection sumps, requirements of action if fluids found in the leak detection sump are verified as a leakage or exceed allowable amounts.

ii. A contingency plan will define a course of action, resources available on site and notification requirements for the most probable spillage or leakage situation which may occur at this site. The plan should include the appropriate response action for containment, minimizing the damage and possible remedies, will be submitted for review and approval before operation can be authorized.

iii. Records of the water balance for all fluids must be kept throughout the life of the project.

iv. An annual evaluation of the operation and inventory of fluids for making necessary modifications to the operation, and to accommodate any increase in storm water.

v. Trigger mechanisms or threshold parameters tied to inventory of fluids that would require actions to prevent overflows, such as pumping fluids to other portions of the

pad, building emergency containment structures, enhanced evaporation, treatment and discharge under emergency conditions, etc.

b. Details of the solvent and grease handling and disposal facilities must be submitted for review.

c. Details of the storage areas, within the process plant, which will contain spills, leaks, etc., must be provided for review such as containment berms, liners, conveyance to process ponds etc. The process plant and reagent forage areas should have concrete floors coated to protect the concrete from chemicals such as acids. The floors should slope to drains, sumps or waterways which will direct spillage or leakage to the process ponds.

5. STORM WATER AND OTHER ITEMS

a. Please contact Claron Bjork, Ph.D. of the Southeastern Utah District Health Department at 801-637-3671 for the review and approval of a subsurface domestic wastewater disposal system at the site. Any 5000-gallons per day or less disposal system must meet the requirements of R317-501 to 513, *Individual Wastewater Disposal Systems, Utah Administrative Code.* Larger systems treating more than 5000 gallons per day will be reviewed and approved by us, in accordance with the requirements of R317-5, *Large Subsurface Wastewater Disposal Systems, Utah Administrative Code.*

b. Any mine water generated from the mined areas will be either contained within the pits or used for process waste makeup. A Utah Pollutant Discharge Elimination System (UPDES) permit must be obtained from this office for any discharge to surface waters. For any discharge to water courses, please submit an application for a Utah Pollutant Discharge Elimination System discharge permit available under R317-8, *Utah Administrative Code.*

c. Mine water generated from the mined areas may be used for dust suppression if it meets the criteria for its intended use. Please refer to R317-1, *Utah Administrative Code,* for further guidance. You may propose such reuse with necessary details for our review and approval.

d. Dust Suppression Utilizing Naturally Contaminated Ground Water

The draft-EIS states .. .. *Storm water runoff of sediment-laden water could transport the radio nuclides (bound to the sediments) to surface water drainage and then down those drainage.* .. .. This may be true of radio nuclides such as radium and thorium which tend to adhere to soils. However, uranium is very mobile and would be dissolved and transported further offsite with the sediments. Storm water discharges could potentially reach the Delores river. The maximum discharge limits allowed under applicable Environmental Protection Agency [EPA] guidelines for a one-day discharge is 10 pico curies [pCi] per liter for dissolved radium-226; 30 pCi per liter; for total radium-226; and 4.0 milligrams [mg] per liter for uranium. Storm water runoff comingled with this ground water used for dust suppression, must not exceed these standards. An evaluation of this aspect will be relevant in the review of the storm water permit application, and must be submitted.. In any case, an

alternative water source or strategy for dust suppression is essential from a pollution prevention standpoint.

We are in the process of drafting the combined construction and ground water permit. We need the foregoing comments addressed satisfactorily to enable us to complete the permit draft before publication for comments. If we can be of further assistance, please let me know or contact Mr. Lyle Stott or Mr. Dennis Fredrick.

Best regards,

Kiran L. Bhayani, P.E., D. EE.
Manager, Design Evaluation Section

KLB:LWS:lws

cc: Lynn Jackson, US Bureau of Land Management, Moab District
Tony Gallegos, Utah Division of Oil, Gas and Mining
David R. Ariotti, P. E., Southeast District Engineer, Utah Dept. of Environmental Quality
Claron Bjork, Ph. D., Director, Environmental Health,. Southeastern Utah District Health Dept.
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